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(54) **Nucleotomy Instrument**

(57) A nucleotomy instrument 1, e.g. for the removal of nuclear material from an intervertebral disc, comprises a tube 2 with an open distal end, a means at the distal end of the tube to engage nuclear material and to cause the deposit of nuclear material within the tube 2 (e.g. blades 6 or a drilling member 15-Fig. 5) and there being a means to cause the withdrawal along the tube of nuclear material deposited in the tube (e.g. a source of suction 5).

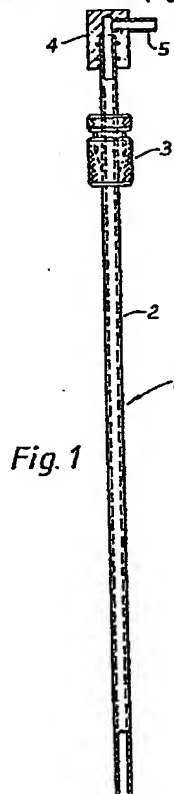


Fig. 1

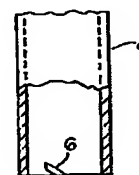
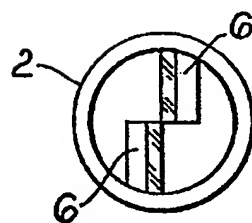
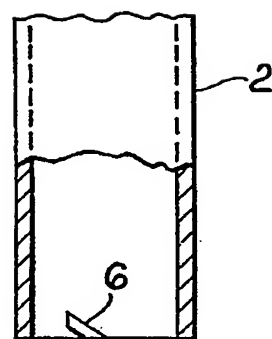
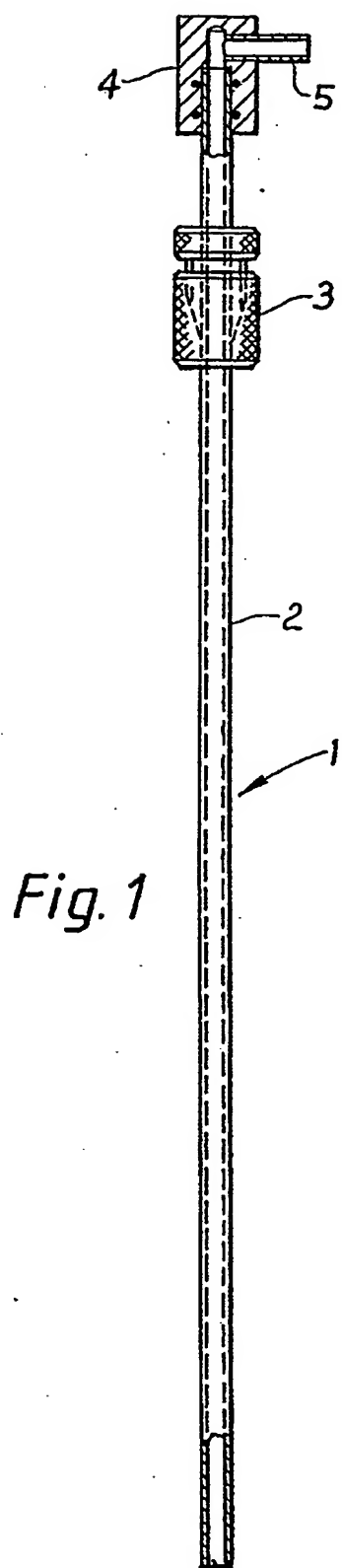
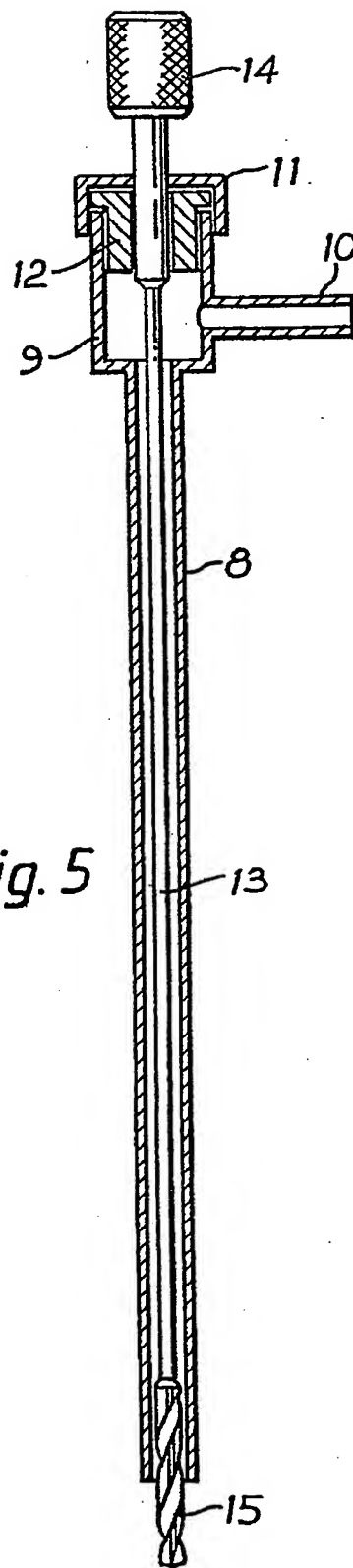
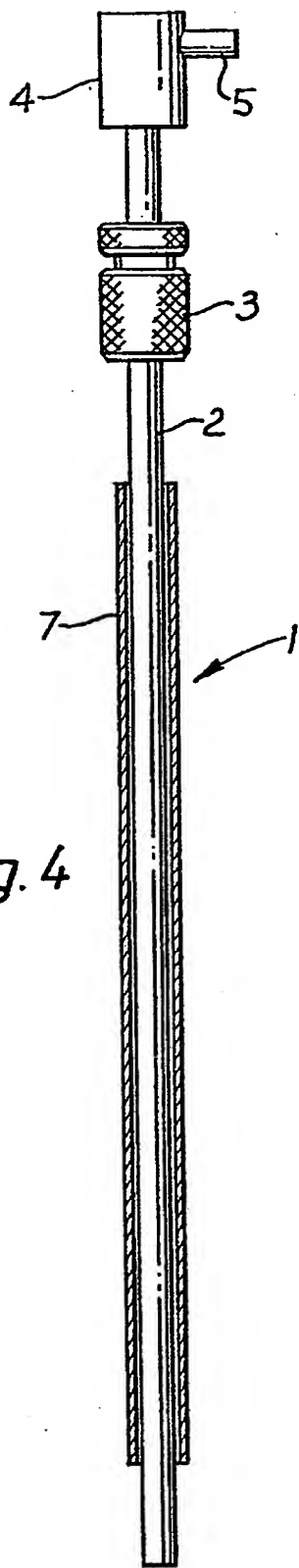


Fig. 2

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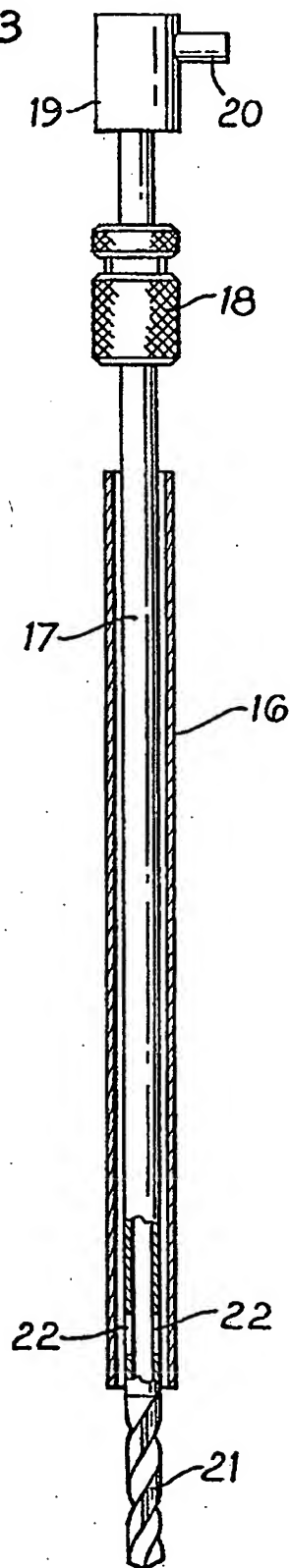


Fig. 6

# NUCLECTOMY INSTRUMENT

This invention relates to a nucleectomy instrument, particularly, but not exclusively for the removal of nuclear material from an intervertebral disc.

Between adjacent vertebrae of the spine there is an  
5 intervertebral disc composed of an annulus fibrosus within which is the nucleus pulposus. In the event of the prolapse of a disc, a frequent result is that a part of the annulus fibrosus presses against a nerve root extending from the spinal cord, to the considerable discomfort of the patient.

10 To relieve the patient, a surgical procedure called discectomy is known where the entire prolapsed intervertebral disc is removed, or alternatively the nucleus pulposus is removed together with that part of the annulus fibrosus in contact with the nerve root.

15 Thus it is known to employ a rongeur to remove the entire intervertebral disc, a forcep like instrument with cup-shaped jaws, but this is a time consuming process due to the fact that a rongeur has to be used repeatedly to remove small fragments at a time, and the cup jaws of the rongeur  
20 repeatedly emptied.

The object of the present invention is to provide an instrument that avoids those disadvantages mentioned above, and which has uses other than in operations on parts of the anatomy other than intervertebral discs.

25 According to the present invention, a nucleectomy instrument comprises a tube with an open distal end, a means at the distal end of the tube to engage nuclear material and

to cause the deposit of nuclear material within the tube and there being a means to cause the withdrawal along the tube of nuclear material deposited in the tube.

Thus, in its simplest form, two diametrically disposed  
5 angled blades can be disposed in the open distal end of the tube, and the proximal end of the tube connected to suction. With then the tube brought into contact with nuclear material, a gentle rotation of the tube causes the blades to direct nuclear material into the tube, the applied suction causing  
10 the removal of the nuclear material along the tube.

To ensure that tissues, nerves or the like in the vicinity of the nuclear material are not unduly disturbed or damaged, it is preferred to provide said rotatable tube within an outer tube that remains stationary whilst the said tube is  
15 rotated and advanced into the nuclear material to cause its removal.

According to a second aspect of the invention, a nucleotomy instrument comprises an outer tube with an open distal end, a rotatable second tube or rod extending through  
20 said outer tube and emerging from said distal end, said emerging part of said second tube or rod terminating in a means to engage nuclear material and cause the deposit of nuclear material in the outer tube, and there being a means to cause the removal of the nuclear material along the outer tube  
25 or the inner tube.

Thus, the outer tube may be connected to suction to remove nuclear material deposited in the outer tube. Alternatively, when a rotatable second tube is provided,

access holes or slots may be provided in the second tube, and the second tube connected to suction to remove nuclear material deposited in the outer tube.

The outer and inner tube or rod may be parallel sided or may taper distally or proximally whichever may be convenient. The outer tube may also be curved longitudinally to suit specific anatomical requirements. Desirably, in addition to being rotatable, the second rod or tube may be capable of being advanced and retracted through the outer tube.

The emergent section of the second tube or rod may be formed after the manner of a helically fluted drill, or as a helical cutter blade and may be formed of solid material or of an appropriate fibrous material. Thus, as the helically fluted drill or the helical cutter blade engages nuclear material it is carried by the helical fluting or the curvature of the blade into the outer tube.

When it is the outer tube that is connected to suction, preferably, an enlarged chamber is provided on the proximal end with a connection to a source of suction, the open end of the chamber having a guide sleeve for the second tube or rod and a cap to form a sliding seal with the end of the second tube or rod passing out of the second tube through the guide sleeve. Preferably a means suitable to be gripped by the operative, e.g., a knurled knob, is provided at the emergent end of the second tube or rod.

According to a third aspect of the invention, a method of removing nuclear material comprises positioning a tube in

contact with the nuclear material said tube having at its open distal end a means to engage the nuclear material, rotating the tube to cause the deposit of nuclear material within the tube, and removing said nuclear material along the tube.

5           According to yet another aspect of the invention, a method of removing nuclear material comprises positioning an outer tube in close proximity to the nuclear material and to bring the end of an inner assembly to the outer tube, into contact with the nuclear material rotating the inner assembly  
10       to cause the deposit of nuclear material within the outer tube and removing the nuclear material along the outer tube or the inner assembly by suction. To enable removal along the inner assembly, the inner assembly is formed by a second tube.

          In the application of the invention to an  
15       intervertebral disc, access to the spine and nucleus pulposus can be achieved by any known and appropriate surgical technique, and the instrument of the invention introduced against an exposed part of the nucleus pulposus rotation of the tube or the inner assembly causing the instrument to  
20       penetrate and into the nucleus pulposus, continued rotation and if desired reciprocation of the tube or the inner assembly causing the removal of the nucleus pulposus.

          It will be understood that in addition to the above application, the instrument of the invention may equally be  
25       used in the removal of for example mucous from airways, removal of subcutaneous fat, removal of liver tissue, aqueous or vitreous humours, cancellous bone and the contents of tumor material.



Four embodiments of an instrument in accordance with the present invention will now be described by way of example only with respect to the accompanying drawings; in which:-

Figure 1 is a part-sectional side elevation of one  
5 embodiment of nucleotomy instrument, according to the invention;

Figure 2 is an enlarged view of the operative end of the instrument of Figure 1;

Figure 3 is an end view of Figure 2;

10 Figure 4 is a part-sectional side elevation of a second embodiment of nucleotomy instrument according to the invention;

Figure 5 is a part-sectional side elevation of a third  
15 embodiment of nucleotomy instrument according to the invention; and

Figure 6 is a part-sectional side elevation of a fourth embodiment of nucleotomy instrument according to the invention.

In Figures 1 to 3, a nucleotomy instrument 1 comprises  
20 an elongate tube 2 connected to a hand grip 3, rotatably connected to a support 4 for an upper tube member 5 for connection to a source of suction. At the operative end of the tube 2 as is shown more particularly by Figures 2 and 3, a pair of angled cutting blades 6 extend diametrically across  
25 the open end of the tube.

Thus, with the operative end of the tube 2 brought into contact with nuclear material to be removed, and with the upper tube 5 connected to a source of suction, the support 4

can be gripped in one hand and the hand grip 3 held by the other, and the tube gently rotated by the hand grip whilst at the same time the tube is eased into the nuclear material, and when the blades 6 sever small pieces of nuclear material and deposit them in the end of the tube 2, to be drawn away along the tube 2 by the applied suction.

In certain applications, it is necessary to pass the instrument through tissue to reach the nuclear material, and equally so that the nuclear material can be in very close proximity to nerves. Here, considerable care needs to be exercised to avoid or minimise damage to tissue and to nerves. Thus, and as is shown in Figure 4, the instrument 1 of Figure 1 can be positioned within an outer tube 7 introduced simultaneously into the vicinity of the nuclear material, and when the device 1 can be operated as described above, with the outer tube held stationary.

In Figure 5, a nucleotomy instrument comprises an outer tube 8 having a chamber 9 at one end with a connection 10 to a source of suction. The chamber 10 is closed by a cap 11 and seal 12 with a rotatable rod 13 extending through the seal from a hand grip 14 and down the tube 8 to emerge at the opposite end, and where it is provided with a drill-like or archemidian screw-like cutting member 15. Thus, with the instrument brought into contact with nuclear material, the chamber 9 can be held in one hand to hold the outer tube 8 stationary, and the cutting member 15 rotated via the hand grip 14, to dislodge nuclear material and deposit it in the outer tube, to be drawn away along the outer tube by suction.

Figure 6 shows a still further possibility. Here an outer tube 16 has passed along it an inner tube 17, on which a hand grip 18 is provided, the tube extending to and being rotatably connected to, a support 19 having an upper tube 20 for connection to a source of suction. At the operative end, the inner tube has a drill-like or archimedian screw-like cutting member 21, and spaced above the cutting device, the inner tube has one or more apertures 22 leading to the interior of the inner tube. Here, and with the instrument brought into contact with nuclear material, the outer tube 16 is held stationary, and the inner tube rotated, the cutting member 21 dislodging small pieces of nuclear material and depositing them in the end of the outer tube 16, from where it is drawn by suction through the apertures 22 in the inner tube and away along the inner tube by suction.

# CLAIMS

1. A nucleotomy instrument comprising a tube with an open distal end, a means at the distal end of the tube to engage nuclear material and to cause the deposit of nuclear material within the tube and there being a means to cause the withdrawal along the tube of nuclear material deposited in the tube.

2. A nucleotomy instrument as in Claim 1, wherein two diametrically disposed angled blades are disposed in the open distal end of the tube.

3. A nucleotomy instrument as in Claim 1 or Claim 2, wherein the said tube is connected to a source of suction.

4. A nucleotomy instrument as in any of Claims 1 to 3, wherein said tube is rotatively and slidably located in an outer tube.

5. A nucleotomy instrument comprising an outer tube with an open distal end, a rotatable second tube or rod extending through said outer tube and emerging from said distal end, said emerging part of said second tube or rod terminating in a means to engage nuclear material and cause the deposit of nuclear material in the outer tube, and there being a means to cause the removal of the nuclear material along the outer tube or the inner tube.

6. A nucleotomy instrument as in Claim 5, wherein the outer tube is connected to a source of suction.

7. A nucleotomy instrument as in Claim 5 and when a rotatable second tube is provided, the second tube is connected to a source of suction, and access holes are

provided in the second tube to allow the passage of nuclear material deposited in the outer tube.

8. A nucleotomy instrument as in any of Claims 5 to 7, wherein the second tube or rod is provided at its distal end with a helically fluted drill.

9. A nucleotomy instrument as in Claim 8, wherein said helically fluted drill is an archimedes screw.

10. A nucleotomy instrument as in any of Claims 5 to 10, wherein an enlarged chamber is provided on the proximal end with a connection to a source of suction, the open end of the chamber having a guide sleeve for the second tube or rod and a cap to form a sliding seal with the end of the second tube or rod passing out of the second tube through the guide sleeve.

11. A nucleotomy instrument substantially as hereinbefore described with reference to Figures 1 to 3, Figure 4, Figure 5 or Figure 6 of the accompanying drawings.

12. A method of removing nuclear material as herein defined.